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Detecting Weed Infestations in Soybean Using Remote Sensing.

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Abstract

Can weed distribution maps be developed from remote sensed reflectance data? When are the appropriate times to collect these data during the season? What wavebands can be used to distinguish weedy from weed- free areas? This research examined if and when reflectance could be used to distinguish between weed-free and weed-infested (mixed species) areas in soybean and to determine the most useful wavebands to separate crop, weed, and soil reflectance differences. Treatments in the two-year study

included no vegetation (bare soil), weed-free soybean, and weed-infested soybean and, in one year, 80% corn residue cover. Reflectance was measured at several sampling times from May through September in 2001 and 2002 using a hand-held multispectral radiometer equipped with band-limited optical interference filters (460 - 1650 nm). Pixel resolution was 0.8-m. Reflectance in the visible spectral range (460 to 700 nm) generally was similar among treatments. In the near-infrared (NIR) range (>700 to 1650 nm), differences among treatments were observed from soybean growth stage V-3 (about 4 weeks after planting) until mid-July to early August depending on crop vigor and canopy closure (76 cm row spacing in 2001 and 19 cm row spacing in 2002). Reflectance rankings in the NIR range when treatments could be differentiated were consistent between years and, from lowest to highest reflectance, were soil < weed-free < weed-infested areas. Increased reflectance from weed-infested areas was most likely due to increased biomass and canopy cover. Residue masked differences between weed-free and weed- infested areas during the early stages of growth due to high reflectance from the residue and reduced weed numbers in these areas. These results suggest that NIR spectral reflectance collected prior to canopy closure can be used to distinguish weed-infested from weed-free areas.
